4. On *Lysechinus*, a new Genus of Fossil Echinoderms from the Tyrolese Trias.

By J. W. GREGORY, D.Sc., F.G.S., Assistant in the British Museum (Nat. Hist.).

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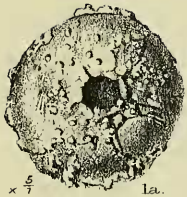
I. *Introduction.*

The genus *Tiarechinus* was founded by Neumayr[1] in 1881 for a fossil from the St. Cassian Trias, which had been previously studied by Laube, whose name, however, had not been published. Neumayr described the fossil as an Echinoid having characters which allied it to the Archæocidaridæ, Cidaridæ, and Diadematidæ. He included it temporarily in the first-named family, but thought it would probably be necessary to institute for it a new order, intermediate between the Palæechinoidea and Euechinoidea. The main characters of the genus relied on by its founder were its large apical disc, short ambulacra, large mouth, and its having the granulation uniform, except for four small tubercles at the oral end of each interambulacrum. He thought that he could recognize certain sutures by the use of glycerine, but it was reserved for Loven[2] to prove that each interambulacrum consists of four plates, three vertical plates resting on a single oral plate. This discovery showed that *Tiarechinus* was even more abnormal than Neumayr thought. Duncan[3], in 1890, accordingly made it the type of a new order, the Plesiocidaroida, in which it has since been allowed to remain in solitary state. In the same year I found a specimen in the Klipstein Collection in the British Museum, which I at first regarded as a new species of *Tiarechinus*, an opinion which was shared by the late P. H. Carpenter, to whom I showed it; but a careful examination of the type specimen at Vienna, and of others there and in Berlin, showed that it was a distinct genus having the same type of structure.

[1] M. Neumayr, "Morphologische Studien über fossile Echinodermen," Sitz. k. Akad. Wiss. Wien, Bd. lxxxiv. Abt. 1, 1881, pp. 169–176, pl. ii. fig. 4.

[2] S. Lovén, "On Pourtalesia," Handl. K. Svens. Vet.-Akad. Bd. xix. 1883, no. 7, pp. 12, 65, pl. xiii.

[3] P. M. Duncan. "A Revision of the Genera and Great Groups of the Echinoidea," Journ. Linn. Soc., Zool. vol. xxiii. 1890, p. 19.



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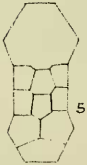

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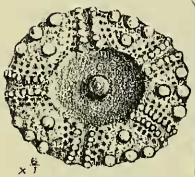

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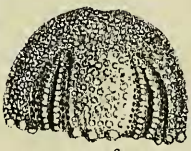

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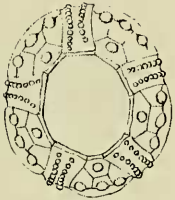
4a

4b



4c

E. Drake del et lith. West, Newman imp.

Lysechinus & Tharechinus.

II. *Description of* Lysechinus.

Lysechinus [1], nov. gen.

Diagnosis.—Plesiocidaroida with the ambulacra limited to grooves on the oral half of the test.

Description.—*Test* small and slightly elliptic; margins tumid; oral and apical surfaces flattened.

Apical system very large, and forming most of the test. The basal ring consists of five plates, forming a closed ring. One (? more) of these is perforated by a pore. Their form is apparently heptagonal.

Ocular plates very large; they are hexagonal; five of the sides are straight, but the sixth is broken by a notch for the end of the ambulacrum.

Periproct large; an irregular pentagonal ellipse.

Ambulacra.—These occur in five (?) somewhat spoon-shaped depressions around the mouth. There are four or five small single pores on each side of each ambulacrum.

Interambulacra large. Apparently each consists of nine plates; there is a large single peristomal plate succeeded by two plates, above which are two series each of three plates.

The ornamentation consists of granules or small tubercles irregularly arranged. The spines are short, with a stout proximal knob.

Peristome very large, occupying nearly the whole of the lower surface of the test.

Dimensions.—Height	4	mm.
Diameter	7	„
Diameter of periproct	$1\frac{1}{2}$	„
„ „ peristome	$3\frac{1}{2}$	„

Distribution.—St. Cassian Schichten. Trias: St. Cassian, Tyrol.

Type Species [2].—*Lysechinus incongruens*, n. sp. Brit. Mus., E 3935.

III. *Affinities of* Lysechinus *and Classification of the* Plesiocidaroida.

The interpretation of the specimen on which this genus is founded is unquestionably difficult, owing to its small size, to the

[1] From λύσις, dissolution or disconnection. In Prof. Bell's 'Catalogue of British Echinoderms,' 1892, pp. 14, 24, the term lissactinic is used as a synonym of azygopodous. This is obviously a printer's error, λύσις having been mistaken for λισσός, smooth. The slip is here corrected at Prof. Bell's request; the word should be "lysactinic."

[2] There being only the one species it is impossible to say which of the characters are specific and which generic. No specific diagnosis is therefore possible.

close union of the plates having obscured the sutures, and to irregularity in the normal symmetry.

The small size of the specimen at once raises the question as to whether it is mature or is only a form so young that it is useless to found a genus upon it. If the specimen were the only echinid in the bed from which it came, or had been associated with echinids of normal size, it would probably have been impossible to give a satisfactory reply to this objection. But *Lysechinus* belongs to an echinid fauna all the members of which are minute. *Tiarechinus* is smaller, while the species of *Cidaris*, *Hypodiadema*, and *Salenia* are of about the same size. The specimens of the last three genera have the characters of maturity, in spite of their minuteness, and thus we cannot take the small size of *Lysechinus* as a proof that it is a larval form.

That it is not a pathological variation cannot be so definitely disproved. This idea seems supported by the fact that the radial symmetry of the specimen is not perfect. One of the interambulacra is more prominent than the rest, but this malformation is as likely to be a post-mortem accident during fossilization as an ante-mortem variation. But we cannot ignore *Lysechinus* as a mere sport until we know some echinid which may be regarded as the form of which it is the sport. Numerous echinids are known with some striking character which may be explained by teratology; but in such cases there is no doubt as to the species, or at least the genus, from which the sport arose. There is no known Triassic or Palæozoic echinid which resembles *Lysechinus* and *Tiarechinus*, and from which either genus can be conceived as having originated by a single variation. Several specimens of *Tiarechinus* are known, and they all agree in structure, so that that genus is not teratological; and until we know of some echinid from which *Lysechinus* could have sprung we cannot adopt the easy course of dismissing it as an abortion.

The greatest difficulty presented by the specimen is due to the close union of the plate, whereby the recognition of the sutures is difficult. By the aid of Lovén's fluid I believe that I can see sutures which show that each interambulacrum consists of nine plates, arranged as follows:—

1. Adjoining the genital plate are three quadrangular plates.
2. Three quadrangular plates, each bearing a tubercle.
3. Two angular plates, each bearing a tubercle.
4. One peristomal plate.

This arrangement is not altogether free from doubt, for it is difficult to discriminate between cracks and sutures, and they cannot be detected in all the areas [1].

[1] The sutures could probably be exposed by the application of weak acid but this method is not invariably successful, and so long as the specimen is unique it is not advisable to subject it to any risk.

The characters of *Lysechinus* which are unmistakable are the large mouth and apical system, and the small ambulacra occurring in grooves on the oral aspect of the test. These leave no doubt that *Lysechinus* is most nearly allied to *Tiarechinus*, and must be included as a second genus of Plesiocidaroida. It differs, however, from *Tiarechinus* in several important characters, of which the most remarkable are the limitation of the ambulacra to grooves on the oral half of the test, and the greater number of plates in the interambulacra. These differences are so important that it seems inadvisable to keep both genera in the same family, especially as neither genus appears to be on the direct line of descent of the other.

I therefore propose to classify the order as follows:—

ECHINOIDEA REGULARIA.

Order PLESIOCIDAROIDA.

Diagnosis.—Echinoidea with a small rigid test; peristome and periproct central and opposite. Periproct in the centre of an apical system of large plates, which constitute half of the whole test. The ambulacral areas are short and biserial. The interambulacra begin with a single peristomal plate. There are no external gills.

Family 1. Tiarechinidæ.

Diagnosis.—Plesiocidaroida with ambulacra with biserial pores. Each interambulacrum consists of four plates, viz., a single peristomal plate, and three tall vertical plates in a horizontal row.

Genus Tiarechinus, Neumayr, 1881.

Species *Tiarechinus princeps*, Neumayr.

Family 2. Lysechinidæ.

Diagnosis.—Plesiocidaroida with ambulacra limited to grooves on lower surface of the test. Each interambulacrum begins with a single peristomal plate, succeeded by a row of two plates, and this by one or more containing three plates.

Genus Lysechinus, n. gen.

Species *Lysechinus incongruens*, n. sp.

IV. *Affinities of the* Plesiocidaroida.

After Loven's skilful analysis of the test of *Tiarechinus*, and discovery of the constitution of the apical area, the genus became of great importance in Echinoderm morphology. The theory that the apical plates of echinids and the central dorsal plates of stellerids were homologous with the plates that form the calyx of